SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-40

Name: Wilmarth Lake **County**: Aurora
Legal Description: T105N-R65W-Sec 35, 36
Location from nearest town: 10 miles north, 4 miles west of Plankinton, SD

Dates of present survey: May 30, 2007 (all species electrofishing)
Dates of last survey: May 25, 2005 (all species electrofishing)

Primary Game Species	Other Species
Largemouth Bass	Black Bullhead
Bluegill	Yellow Perch
	Black Crappie
	Northern Pike
	Hybrid Sunfish

PHYSICAL DATA

Surface area: 103 acres **Watershed area**: 34,812 acres
Maximum depth: 26 feet **Mean depth**: 11 feet
Volume: 1027 acre-feet **Shoreline length**: 3.2 miles
Contour map available: Yes **Date mapped**: 1969
Lake elevation observed during the survey: 2 ft low
Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Wilmarth Lake was created by the construction of a dam across Firesteel Creek by the Works Progress Administration (WPA) in 1936. The lake was named for Fred Wilmarth who had lived on a farm near the lake since 1906. Wilmarth gets its water from the East and West Forks of Firesteel Creek and their associated watersheds. Outflows exit over the spillway into Firesteel Creek and continue downstream through Lake Mitchell into the James River.

Ownership of Lake and Adjacent Lakeshore Properties

Except for the extreme west and a portion of the north shore, Wilmarth Lake is owned and managed by the South Dakota Department of Game, Fish and Parks.

Fishing Access

The Wilmarth Lake Access Area on the northwest end of the lake contains a boat ramp and public toilet. Several vehicle trails provide shore-fishing access along the north side of the lake.

Field Observations of Water Quality and Aquatic Vegetation

The water in Wilmarth Lake was somewhat turbid during the survey with a Secchi depth measurement of 0.5 m (20 in). Wilmarth is heavily vegetated with common cattail (*Typha spp.*) and coontail (*Ceratophyllum demersum*) around most of the shoreline.

BIOLOGICAL DATA

Methods:

Wilmarth Lake was sampled on May 30, 2007 by one hour and 40 minutes of nighttime electrofishing covering five different sites. Electrofishing sites are displayed in Figure 4.

Results and Discussion:

Electrofishing Catch

Bluegill (39.7%), black bullhead (20.2%), and largemouth bass (19.1%) were the most common species in the electrofishing sample (Table 1). Other species sampled were black crappie, northern pike, hybrid sunfish, yellow perch, and green sunfish.

Table 1. Catch from one hour and forty minutes of electrofishing at five sites on Wilmarth Lake, Aurora County, May 30, 2007. CPUE was calculated as catch/hour.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	183	39.7	109.8	±45.1	66.0	31	1	139
Black Bullhead	93	20.2	55.8	±24.7	142.2	52	43	106
Largemouth Bass	88	19.1	52.8	±7.1	44.7	70	60	116
Black Crappie	74	16.1	44.4	±4.2	33.9	38	0	109
Northern Pike	15	3.3	9.0	±3.6	1.5	8	0	84
Hybrid Sunfish	4	0.9	2.4	±2.7	0.0	--	--	--
Yellow Perch	2	0.4	1.2	±1.8	35.1	--	--	--
Green Sunfish	2	0.4	1.2	±1.1	0.5	--	--	--

* 3 years (2001, 2003, 2005).

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPH of at least 20 for stock length (≥20 cm, 8 in) and longer fish and a RSD-P of 20-40.

Largemouth bass catch per hour (CPH) was 52.8 for all sizes of fish (twice the six-year mean) and 24.0 for stock length (≥20 cm, 8 in) and longer fish (Table 2). The bass sampled ranged from 9 to 51 cm (3.5 to 20.0 inches) (Figure 1) long and one to nine years old (Table 3). Forty bass over 20 cm (8 in) were pit tagged and will be monitored in future surveys.

Bass growth was faster than statewide, and small lakes and impoundments means and similar to regional means at age-5 (Table 3). A large year class was naturally-produced in 2006.

Table 2. Largemouth bass electrofishing CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 1999-2007.

	1999	2001	2002	2003	2004	2005	2007	Mean*
CPUE	19.1	4		45.5		28.0	52.8	21.1
PSD	--	100		32		98	70	69
RSD-P	--	63		18		12	60	26
Mean Wr	--	100		125		111	116	114

* 6 years (1997, 1998, 1999, 2001, 2003, 2005) for CPUE; 4 years (1997, 2001, 2003, 2005) for PSD, RSD-P and mean Wr

Table 3. Average back-calculated lengths (mm) for each age class of largemouth bass in Wilmarth Lake, Aurora County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	48	102							
2005	2	12	95	244						
2004	3	3	117	288	349					
2003	4	3	129	253	341	374				
2002	5	15	117	221	323	374	403			
2001	6	3	120	221	319	377	406	428		
2000	7	2	131	182	238	298	332	372	408	
1998	9	1	102	232	294	353	389	429	452	474
All Classes		**87**	**114**	**234**	**311**	**355**	**383**	**409**	**430**	**474**
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

Bluegill

Management objective: Maintain a bluegill population with an electrofishing CPH of at least 50 and a RSD-18 of at least 20.

Bluegill electrofishing CPUE increased from 2005 and was identical to 2003 (Table 4). Age-2 bluegills dominated the sample explaining the decrease in PSD and RSD-18 when compared to 2005 (Figure 2). Bluegill condition (Wr) has remained high.

Bluegill growth was near statewide, regional and small lakes and impoundments means (Table 5) and was substantially better than documented in previous lake surveys. Bluegill growth may have improved in response to decreased black crappie abundance (Table 6). No bluegills over age-4 were sampled.

Table 4. Bluegill CPUE, PSD, RSD-18, and mean Wr for Wilmarth Lake, Aurora County, 1997-2007[1].

	1997	1999	2000	2001	2002	2003	2004	2005	2007
CPUE[2]	4.9	1.3		427.5		109.8		19.0	109.8
PSD	93	62		70		32		28	31
RSD-18	12	23		0		21		6	4
Mean Wr	118	102		108		125		123	139

[1] 1997, and 1999 trap-net data. 2001, 2003, 2005 and 2007 electrofishing data
[2] 2001, 2003, 2005 and 2007 CPUE reported as catch/hour

Table 5. Average back-calculated lengths (mm) for each age class of bluegill in Wilmarth Lake, Aurora County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	9	68							
2005	2	160	45	124						
2004	3	5	35	96	131					
2003	4	9	41	111	146	179				
All Classes		**183**	**47**	**111**	**139**	**179**				
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
SLI* Mean			53	101	138	163	180			

*Small Lakes and Impoundments (<150 acres)

Black Crappie

The black crappie population in Wilmarth Lake is very cyclic (Table 6). Intermittent strong year classes have been produced but mortality is very high.

In 2007, population size structure had improved and growth exceeded the statewide and small lakes and impoundments means (Table 7). Condition was also good with a Wr of 109.

Table 6. Black crappie CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 1997-2007[1].

	1997	1999	2000	2001	2002	2003	2004	2005	2007
CPUE[2]	0	0.1		4.5		300.0		0.3	44.4
PSD		--		0		0		--	38
RSD-P		--		--		0		--	0
Mean Wr		--		94		115		--	109

[1] 1997 and 1999 trap-net data. 2001, 2003, 2005, and 2007 electrofishing data
[2] 2001, 2003, 2005 and 2007 CPUE reported as catch/hour.

Table 7. Average back-calculated lengths (mm) for each age class of black crappie in Wilmarth Lake, Aurora County, 2007.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2006	1	66	94							
2005	2	5	105	191						
2004	3	3	72	159	220					
All Classes		**74**	**90**	**175**	**220**					
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Black Bullhead

Management objective: Maintain a black bullhead fishery with an electrofishing CPH of no more than 50.

The 2007 black bullhead electrofishing CPUE was similar to 2005; however, RSD-P was much higher (Table 8). Bullheads ranged in length from 11 to 34 cm (4.3-13.4 in) long with a mean length of 19 cm (7.5 in) (Figure 3).

Table 8. Black bullhead CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 1995-2007[1].

	1997	1999	2000	2001	2002	2003	2004	2005	2007
CPUE[2]	159.1	585.1		803.7		312.3		55.0	55.8
PSD	11	13		7		70		57	52
RSD-P	0	1		0		0		0	43
Mean Wr	--	83		--		94		101	106

[1] 1997, and 1999 trap-net data. 2001, 2003 and 2005, 2007 electrofishing data
[2] 2001, 2003, 2005 and 2007 CPUE reported as catch/hour

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor Wilmarth with an electrofishing survey every other year.

2. Continue the aquatic vegetation control program to maintain open areas for shore fishing.

3. If natural reproduction does not continue to maintain the population, stock 15-30 cm (6-12 inch) largemouth bass to control bullheads, increase panfish quality and provide a desirable bass fishery.

Table 9. Stocking record for Wilmarth Lake, Aurora County, 1991-2007.

Year	Number	Species	Size
1991	15,584	Largemouth Bass	Fingerling
	20,000	Largemouth Bass	Med. Fingerling
1992	10,000	Channel Catfish	Fingerling
	2,530	Walleye	Lrg. Fingerling
1994	3,000	Walleye	Lrg. Fingerling
	1,144	Yellow Perch	Adult
1995	5,000	Walleye	Sml. Fingerling
	1,000	Yellow Perch	Adult
1996	10,400	Largemouth Bass	Fingerling
1997	175	Largemouth Bass	Fingerling
1998	10,000	Largemouth Bass	Fingerling
1999	9,500	Largemouth Bass	Fingerling
2002	136	Largemouth Bass	Adult

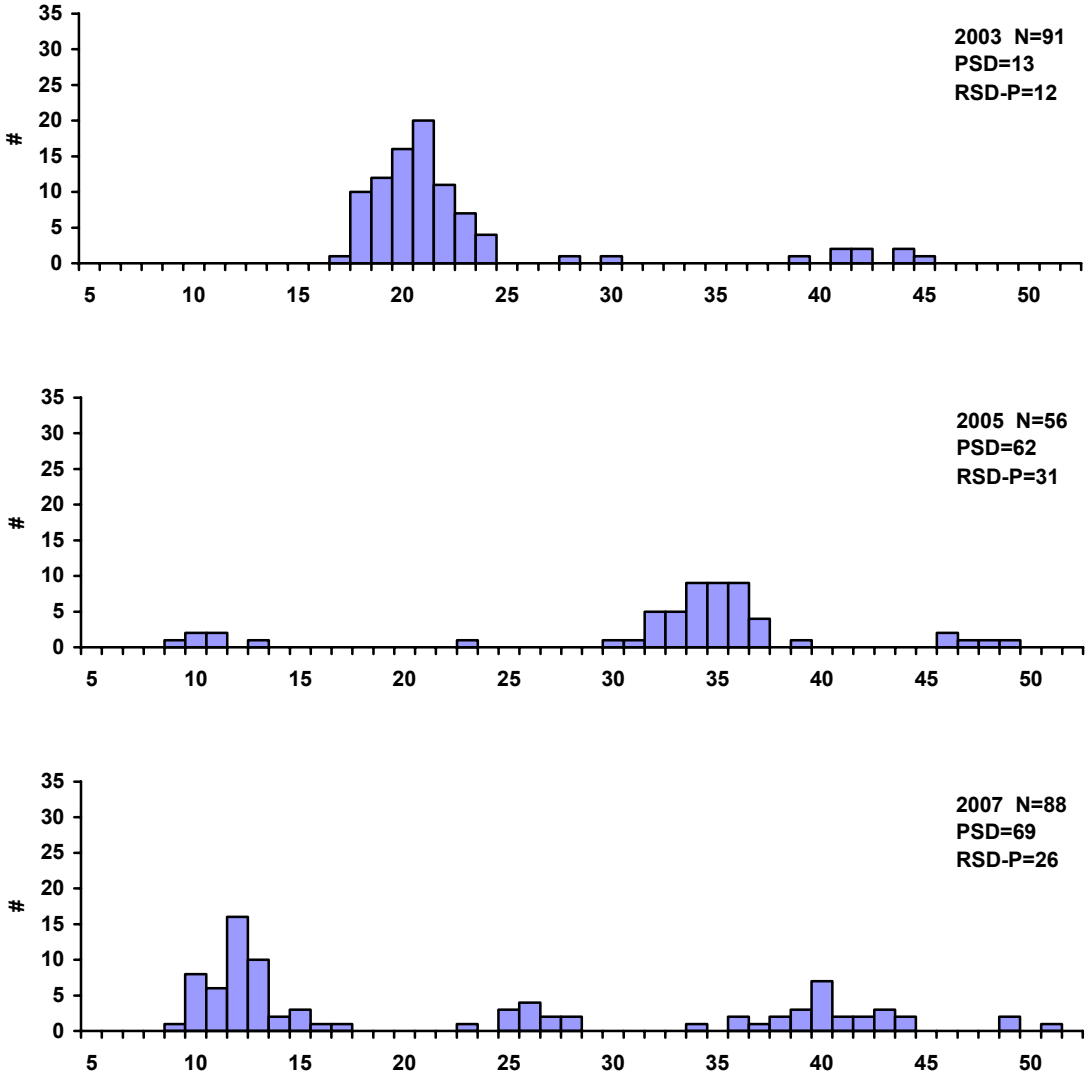


Figure 1. Length frequency histograms for largemouth bass sampled by electrofishing in Wilmarth Lake, Aurora County, 2003, 2005 and 2007.

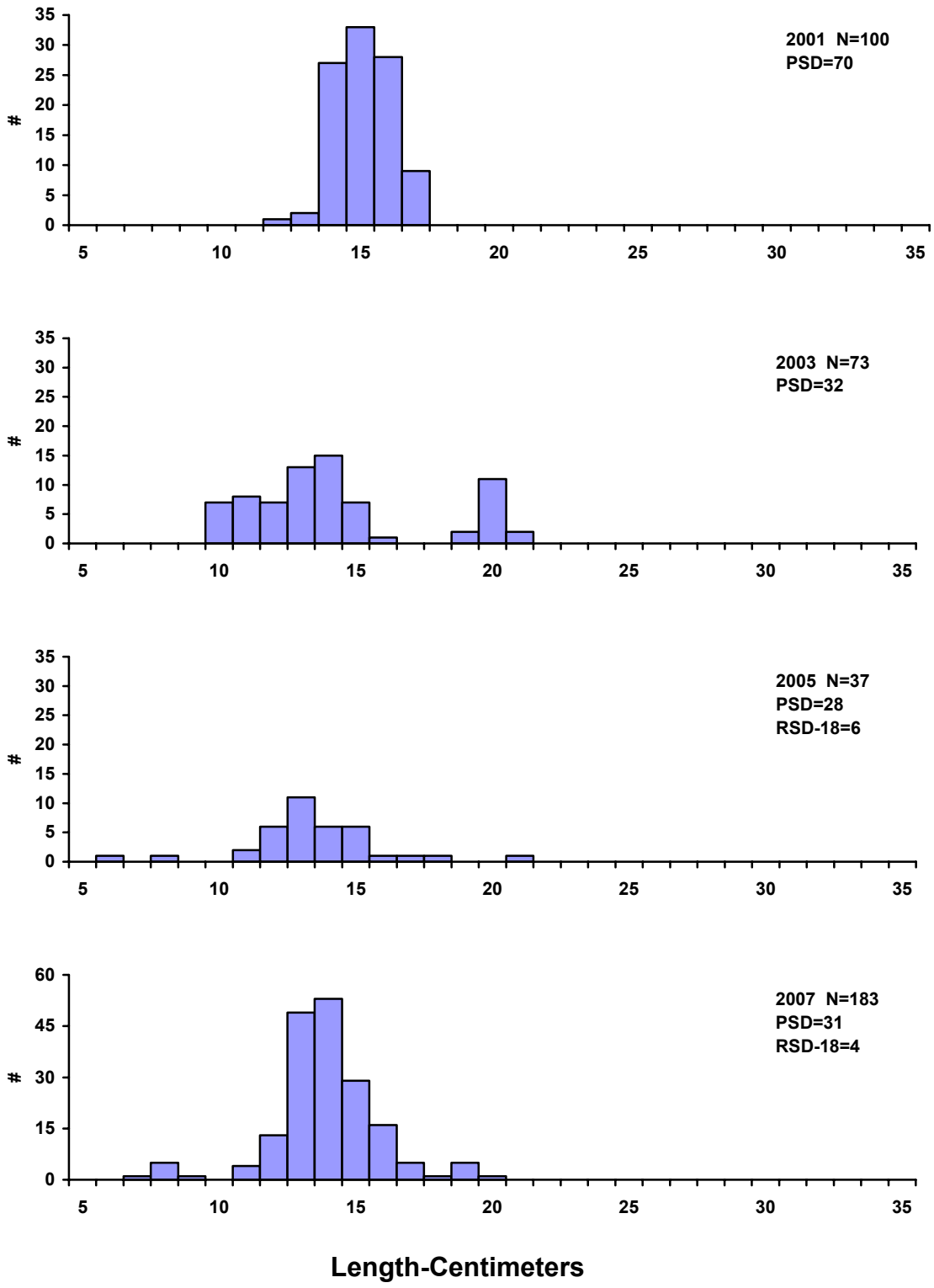


Figure 2. Length frequency histograms for bluegill sampled by electrofishing in Wilmarth Lake, Aurora County, 2001, 2003, 2005 and 2007.

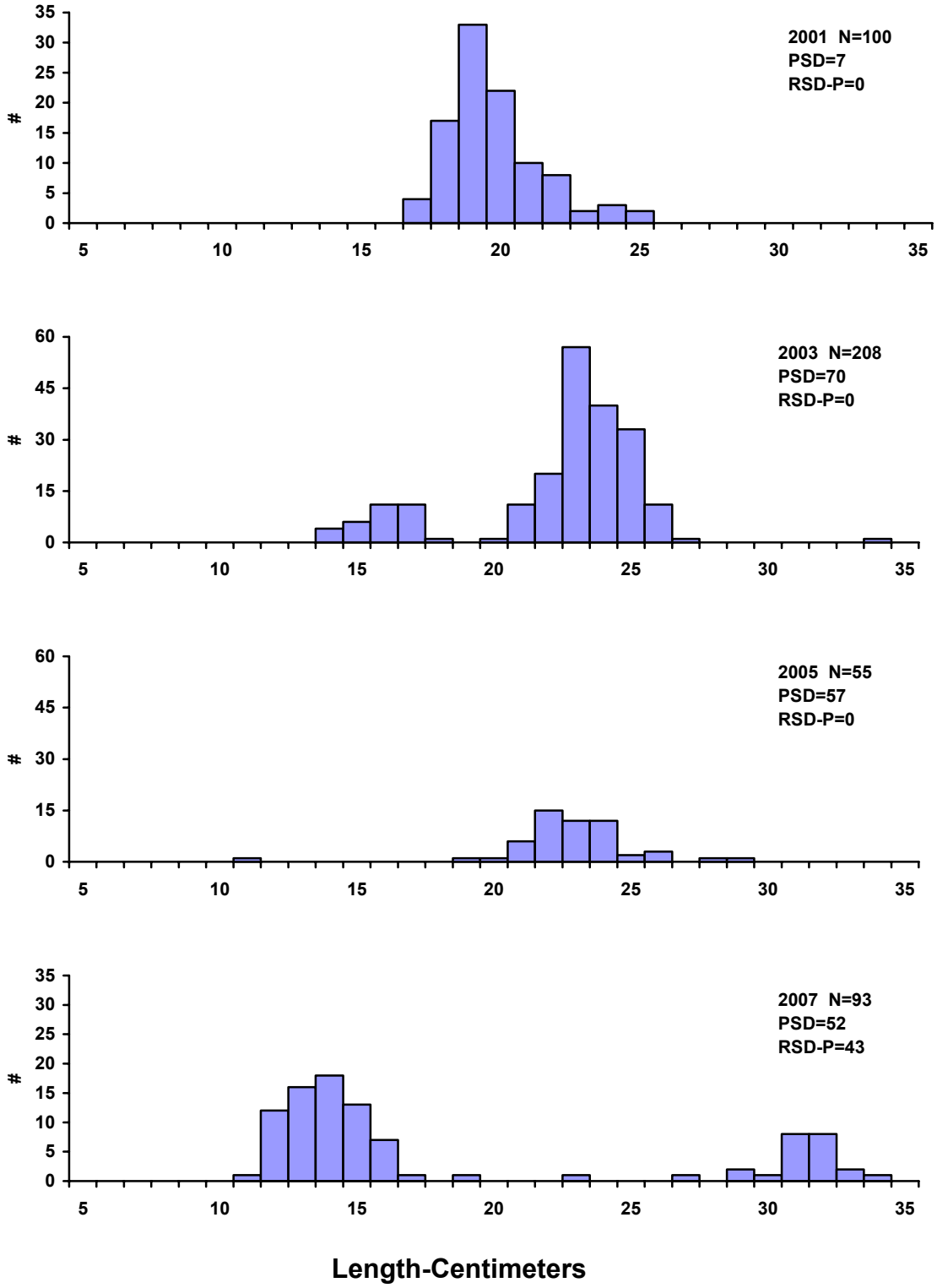
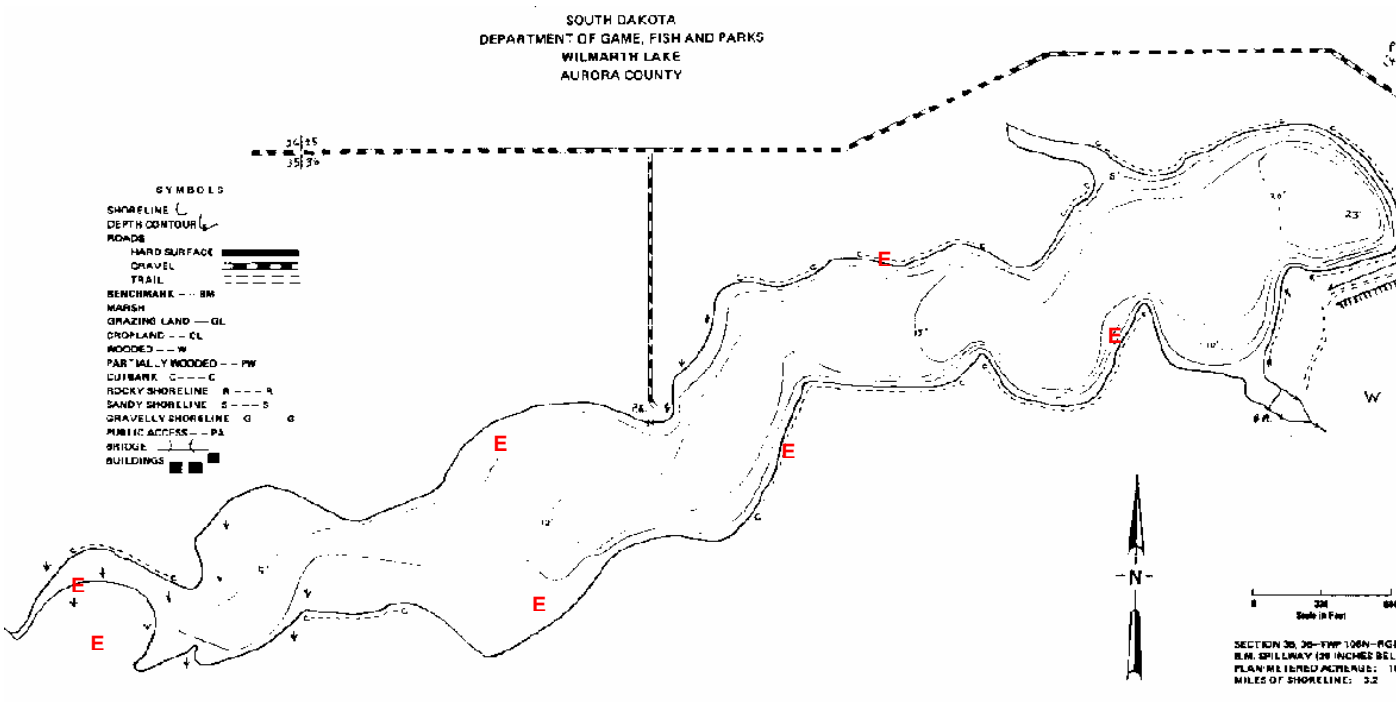


Figure 3. Length frequency histograms for black bullheads sampled by electrofishing in Wilmarth Lake, Aurora County, 2001, 2003, 2005 and 2007.



Legend
Electrofishing Sites: E

Figure 4. Sampling locations on Wilmarth Lake, Aurora County, 2007.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

$$RSD\text{-}18 = \frac{\text{Number of fish} > 18\text{ cm}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.